Amendments to the Claims are reflected in the listing of claims that begins on page 3 of this paper.

Remarks/Arguments begin on page 11 of this paper.

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (cancelled)

2. (currently amended) ~~The electromechanical valve assembly of claim 1~~ An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat of said engine cylinder to prevent gas flow into or out of said engine cylinder.; and

wherein said rotor includes a first helical groove and said valve stem includes a second complemental helical groove, said first and second helical grooves forming a first raceway between said rotor and said valve stem, said valve assembly further including ball bearings disposed in said first raceway that allow axial movement of said valve responsive to rotation of said rotor.

3. (original) The electromechanical valve assembly of claim 2 wherein said rotor is further configured to recirculate said ball bearings from an end position in said first raceway to a start position in said raceway.

4. (original) The electromechanical valve assembly of claim 2 wherein said valve stem is threadably engaged with said rotor.

5 (original) The electromechanical valve assembly of claim 2 wherein said valve stem has a multiple lead engagement with said rotor.

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6. (currently amended) ~~The electromechanical valve assembly of claim 1~~ An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat of said engine cylinder to prevent gas flow into or out of said engine cylinder.; and

; and

wherein said rotor includes an outer ring magnet and an inner ballnut adjacent said ring magnet, said inner ballnut defining said bore.

7. (original) The electromechanical valve assembly of claim 6 wherein said outer ring magnet comprises first and second magnet segments disposed adjacent one another.

8. (currently amended) ~~The electromechanical valve assembly of claim 1~~ An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat of said engine cylinder to prevent gas flow into or out of said engine cylinder.; and

further comprising a centering spring and an enclosure, said stator and said rotor being disposed in said enclosure, said centering spring contacting said enclosure and a first end of said valve stem for moving said valve to a predetermined axial position when said stator is de-energized.

9-11. (cancelled)

12. (currently amended) ~~The electromechanical valve assembly of claim 1~~ An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat of said engine cylinder to prevent gas flow into or out of said engine cylinder.; and

wherein said valve has a bore therein, said valve further comprising a magneto-strictive sensor with a metal shaft disposed axially within said bore of said valve, said magneto-strictive sensor generating a position signal indicative of an axial position of said valve.

13. (previously presented) An electromechanical valve assembly for an internal combustion engine, comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough, said rotor having a first helical groove;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis, said stator being formed of a plurality of laminated plates;

a valve having a valve stem and a valve head, said valve stem extending generally axially through said bore of said rotor, said valve stem having a second helical groove, said first and second helical grooves forming a raceway between said rotor and said valve stem for holding ball bearings therein and,

a plurality of ball bearings disposed within said raceway wherein said valve moves axially responsive to rotation of said rotor to move said valve head against a valve seat in said engine to prevent gas flow into or out of an engine cylinder.

14. (previously presented) An electromechanical valve assembly for an internal combustion engine, comprising:

a rotary electric actuator configured to rotate a ballnut; and,

a valve having a valve stem and a valve head, said valve stem operatively connected to said ballnut, said valve stem configured to move generally axially responsive to the rotation of said ballnut to selectively engage and disengage said valve head with a valve seat of an engine cylinder.

15-18. (cancelled)

19-21. (withdrawn)

22-23. (cancelled)

24. (previously presented) An electromechanical valve assembly for an internal combustion engine, said valve assembly controlling gas communication between an engine cylinder and a gas conduit in said engine, said assembly comprising:

a rotor centered about a first axis;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis; and,

a valve having a valve stem and a valve head, said valve configured to move said valve head toward a valve seat of said engine when said rotor rotates in a first direction, said valve head movement being stopped upon an indication that said valve head has seated against said valve seat.

25. (previously presented) The electromechanical valve assembly of claim 24 wherein said indication corresponds to a measured position of said valve head being equal to a predetermined position of said valve when said valve head seats against said valve seat.

26. (previously presented) An internal combustion engine, comprising:

an engine cylinder; and,

a camless valve assembly having a valve communicating with said engine cylinder, said assembly adjusting an opening rate of said valve to control gas flow into said engine cylinder, wherein said camless valve assembly includes an electrically driven ball-screw arrangement to axially move a valve head.

27-34. (cancelled)

35. (previously presented) A method for controlling a valve assembly in an engine, said assembly having a rotatable ballnut and a valve configured to move along a first axis in response to rotation of said ballnut, said method comprising:

rotating said ballnut to move a valve head against a valve seat of said engine; and,

stopping said rotation of said ballnut upon an indication that said valve head has contacted said valve seat to prevent gas flow into or out of an engine cylinder.

36. (previously presented) A method for controlling a camless valve assembly in an engine, said engine having an engine cylinder, said valve assembly having a valve communicating with said cylinder, said method comprising:

opening said valve using an electrically driven ball-screw device at a first opening rate to control gas flow into said cylinder during a first combustion cycle of said cylinder; and,

opening said valve using said ball-screw device at a second opening rate to control gas flow into said cylinder during a second combustion cycle of said cylinder.

37-43 (cancelled)

44. (previously presented) A method for controlling an electromechanical valve in an internal combustion engine, comprising:

controlling movement of a valve member based on an electrical control signal;

generating a position signal indicative of a position of said valve member; and,

commanding said valve member to stop when said position signal indicates said valve member is proximate a valve seat of an engine cylinder.

45. (previously presented) The method recited in claim 44 wherein said position signal is generated by a magneto-strictive sensor adjacent said valve member.

46. (currently amended) ~~The electromagnetic valve assembly of claim 1~~ An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat of said engine cylinder to prevent gas flow into or out of said engine cylinder.; and

further comprising a magnet disposed on said rotor and a magneto-strictive sensor adjacent said rotor, said sensor generating a position signal responsive to a rotational position of said magnet.